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Understanding Professional Learning Community (PLC) from a Teacher Leadership Perspective in International Baccalaureate (IB) Schools

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Abstract

This study aims to illuminate how professional interactions among teachers form different types of teacher leadership in schools which, in turn, shapes different levels of teachers' involvement in activities related to their professional learning community (PLC). To investigate certain patterns of teachers' interactions that contribute to the formation of teacher leadership and thereby the development of PLC, two international schools that offer a full continuum of three International Baccalaureate (IB) programs were purposively chosen. The schools are in a similar size in terms of student number and are located in two different countries in East Asia. Using a mixed-methods research approach, the patterns of teacher professional interactions were examined using social network analysis. Next, the degree to which teachers in the case study schools enact practices related to PLCs were assessed and compared through a MANOVA test. Further, based on findings from social network analysis, in-depth semi-structured interviews were conducted with selected, key participants to understand the linkage between teacher leadership and teachers' involvement in their PLC in each case school. From the findings we propose four conceptual types of teacher leadership that explain how teacher leadership shapes different levels of teachers' engagement in PLC in the two case schools. This study contributes to the literature by showing how teachers' professional interactions can form different types of teacher leadership which, in turn, shapes teachers' practices of PLC in international school settings.

Keywords: Teacher Leadership, Typology of Teacher Leadership, Professional Learning Community (PLC), International Baccalaureate (IB), East Asia

Network Perspectives of Teacher Leadership

The notion of teacher leadership has evolved over time. Previously, teacher leaders were viewed as those who possess formal administrative and hierarchical positions such as department heads and grade-level chairs. To enhance the quality of teaching and learning, positions such as subject chairs and curriculum coordinators were established in schools. Such positions tend to involve responsibilities outside the classroom to support school administration. More recent notions of teacher leadership place more emphasis on collegiality among teacher colleagues regarding classroom matters such as instruction, assessment and discipline. Teacher leadership roles can be either formally assigned or they can emerge naturally through teacher interactions. The concept of teacher leadership is closely aligned with the notion of individual empowerment, the belief that teachers hold a central position in the school operations and that leadership is a core function of teaching and learning (York-Barr & Duke, 2004). As such, the contemporary concept of teacher leadership is extended further to include informal roles of teachers who open their classroom practice to scrutiny, share their expertise, ask questions, mentor new teachers and model how teachers collaborate on issues of practice (Ackerman & Mackenzie, 2006). Today, teacher leaders are understood as classroom teachers who share their expertise in myriad forms (Nappi, 2014). Teacher leadership can be perceived as a set of skills demonstrated by teachers who continue to teach students but also have an influence on improving the quality of teaching and learning beyond their own classrooms (Danielson, 2006).

Approximately two decades ago, Ogawa and Bossert (1995) proposed a new perspective on leadership in organizations. They observed that leadership is not confined to specific roles, rather, it flows through the networks of roles that comprise organizations. In addition, leadership is based on the deployment of resources that are distributed throughout the network of roles, with different roles having access to different levels and types of resources (Ogawa & Bossert, 1995). This network perspective of leadership points to the need to investigate the network of relations throughout organizations. Under this premise, the school organization is considered as the unit of network analysis.

The leadership network perspective is further developed in the concept of distributed leadership (Spillane, Halverson, & Diamond, 2001). According to Spillane et al. (2001), school leadership is best understood as a distributed practice that is influenced by social and contextual factors. The interdependence between the individual and the environment reflects how human activity as distributed in the interactive web of actors, artifacts, and the situation is the

appropriate unit of analysis for studying leadership practice.

In the network perspective of school leadership, four roles of teacher leadership can be considered. The brokering role refers to teachers who link other teachers with opportunities for professional learning. This role concerns the translation of the principles of school improvement into the practices of individual classrooms. The brokering role is considered a central responsibility for teacher leaders (Day & Harris, 2003). Next is the mediating role and it refers to teachers who serve as important sources of expertise and information (Harris, 2003). They are able to draw critically upon additional resources and expertise if required. Third is the participative role and it refers to teachers who actively participate in school-wide initiatives or development with a sense of ownership. They may assist other teachers to cohere around a particular development and to foster a more collaborative way of working. Finally, the forging role refers to teachers who formulate mutual learning opportunities based on close relationships with individual teachers (Harris, 2003). When teachers collaborate and share their efforts and base of knowledge, the outcome is greater than the aggregate efforts as individuals (Gronn, 2002). It is believed that when principals share leadership responsibilities with genuine motivation for teacher growth and school improvement and allow teachers to take on leadership roles, the type of collaboration that follows results in facilitating teacher leadership with productive social capital, which in turn increases the scope of effectiveness of the school professional community (Nappi, 2014).

Teacher Leadership as the Web of Teacher Collaboration: Structural and Cultural Features

From the network perspective, teacher leadership is a natural outgrowth of teachers' collaboration across various layers and boundaries within a school organization. More specifically, teacher collaboration can be understood from a structural and functional perspective in that teacher collaboration is shaped by organizational structures (e.g., formal leadership and management structures, timetabling, building levels, subject-based meetings) and it is part of various organizational functions (e.g., communication, influences, links). At the same time, teacher collaboration can be characterized by cultural or micropolitical perspectives. Those who take a fundamentally cultural view tend to describe teachers' work in terms of the norms and beliefs that teachers hold as a consequence of their socialization and their interpretations of experiences in complex social organizations (Riordan & de Costa, 1998). Specifically, while teachers in elementary schools see themselves as teachers of children

whereas high school teachers see themselves as teachers of subjects (Levin & Young, 1994). The nature of the subject discipline, individual teachers' perceptions of the school subject and the subject department, all combine to form the conceptual context in which teachers work (Grossman & Stodolsky, 1995). The contextual context, to the extent that it is shared by members of a department, can be understood as a feature of a department culture, or to use Ball (1981) and Ball and Lacey's (1984) term, a subject subculture. To foster a culture of collaboration, certain structures and work practices can be established in schools. For example, schools can ensure that there are sufficient meeting times in the school schedule, outside of classroom teaching responsibilities, to allow teachers to collaborate (Gladder, 1990).

From the micropolitical perspective, collegiality may take place when individuals and groups seek to pursue their ends, in collaboration or conflict with others (Iannaccone, 1975). Hoyle (1982) defined micropolitical strategies as "those by which individuals and groups seek to use their resources of power and influence to further their interests" (p. 88). In secondary schools, a major part of micropolitical activity tends to be focused on the department" (Ball & Lacey, 1995, p. 96). In attempting to overcome the endemic isolation of teachers, administrators often attempt to impose collegial practices. Contrived collegiality is designed primarily to meet goals determined by administrators, not the teachers themselves. These contrivances result in inflexibility and inefficiency (Hargreaves, 1994). Hargreaves (1994) used the term "balkanization" to describe teachers' collaboration within small groups and these groups are isolated from each other. Therefore, they are essentially an administrative contrivance designed to further the goals of the administrator rather than serve the needs perceived by the teacher. As a consequence, they may have deleterious effects (Hargreaves, 1991, 1994). In sum, the structural and functional features of school organization constitute and are constituted by the cultural and political domains of teacher collaboration.

The Role of Teacher Leadership in Professional Learning Community (PLC)

The "enthusiasm for teacher collaboration" (Little, 1990, p. 509) is premised on the view that collaborative behaviors lead to a variety of positive outcomes, ranging from improvements to individual teachers' classroom teaching performance, through general improvements to the quality of instruction, to effects felt at the level of the school and the profession as a whole. To conceptualize the impacts of various teacher collaborations in a school, the term PLC has been employed in previous studies in recent years. While there are a number of different definitions

of PLC, there is a growing consensus that PLC is constituted by an integration of professional communities and organizational learning (see Stoll & Louis, 2007; Louis & Lee, 2016).

With regard to professional communities, Louis, Kruse and Bryk (1995) introduced five key characteristics or components of professional communities: shared norms and values, collective focus on student learning, deprivatized practice, reflective dialogue, and collaboration. These characteristics has been further categorized into two major domains: normative and behavioral (Bryk, Camburn & Louis, 1999). That being said, shared norms and values and collective focus on student learning are in the normative domain while deprivatized practice and reflective dialogue represent the behavioral domain of professional communities.

Shared norms and values are considered as a normative structure that guide teacher professional behavior (Bryk et al., 1999). These values create a sense of shared responsibility and often vary from school to school. Deprivatized practice includes team teaching, peer coaching and classroom observation. Group interactions allow teachers to share and learn from each other's strengths and eventually lead to an improvement in both classroom practice and collegial relationship (Louis, Marks, & Kruse, 1996). Reflective dialogue emerges when teachers regularly engage in deep discussions with colleagues about their instructional practice (Bryk et al., 1999). While reflection promotes teachers' awareness of their practice and its consequences (Leithwood & Louis, 1998; Louis, Kruse, & Raywid, 1996), engaging conversations help deepen their understanding about the instructional process and enhance new ideas in teaching and learning (Louis & Lee, 2012; 2016). The two behavioral attributes-- reflective dialogue and deprivatized practice--promote collaboration (Leithwood & Louis, 1998). The pedagogical purposes of the collaboration are directly related to instruction and include team-teaching, joint-planning, resource sharing and development, assessment of students, and evaluation of lessons and courses. Team-teaching is a vehicle for greater instructional interaction among teachers (Cohen, 1981).

Organizational learning refers to the construction of meaningful contexts and conditions under which routines are collectively shared and collaboratively practiced (Louis, 2006). In the school context, organizational learning occurs when learning is embedded as an institutional mode of interactions among members. This level of learning can be obtained when there are routines and structures that promote spontaneous patterns of interactions and consequently enhance collaborative practices among organizational members (Crossan, Lane, & White, 1999).

School reformers expect that teachers will turn into leaders who work together across classrooms and disciplines to foster educational reform practices (Lieberman, 1995; Louis, Kruse & Bryk, 1995). There is an increasing focus on teacher leadership as a means to foster PLC as a major vehicle of educational reform. Concurrently, teacher leadership has arisen from collaborative activities such as team teaching, school-based decision making and interdisciplinary curriculum development (Grossman & Richert, 1996; Merz & Fuhrman, 1997) and is regarded as an informal that comprises activities such as planning, communicating goals, regulating activities, creating a pleasant workplace environment, supervising, motivating those supervised and evaluating teaching performance (Harris, 2003). Viewed in this light, teacher leadership is about learning together and constructing meaning and knowledge collectively and collaboratively, which are inextricably intertwined with PLCs.

In summary, teacher leadership is primarily concerned with the belief that all organizational members can lead and that leadership is a form of agency that can be distributed or shared (Harris, 2003). This characteristic resonates with building PLC. That is, the principle of teacher leadership is at the core of building PLCs in schools as teacher leadership is premised upon teachers working in collaboration to learn with and from each other (Harris, 2003).

Research Question

Based on the review of the literature on teacher leadership, this study addresses the question, *How does teacher leadership contribute to building PLCs?*

Methods

The study employed a mixed-methods research approach. First, the patterns of teacher professional interactions were examined using social network analysis to reveal the structural and functional features of teachers' influence on their colleagues' professional work and thereby organizational change. Next, the degree to which teachers in the case study schools enacted practices related to PLCs were assessed and compared through a MANOVA test. Then, based on findings from social network analysis, in-depth semi-structured interviews were conducted with key participants to understand the cultural features of teachers' collaboration and how they shape teachers' involvement in PLC in each case school.

Site Selection

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Our research design targeted two schools in two different countries in East Asia that implement International Baccalaureate (IB) programs[1]. Two schools have a similar number of students and both offer the Primary Years Program, Middle Years Program and Diploma Programme. As collaboration is one of the major attitudes and beliefs around the central theme of becoming successful IB teachers (Bergeron & Dean, 2013; Lee et al., 2012), IB schools are assumed to be an appropriate setting for our intention to explore teacher leadership and PLC.

School A. This school was founded in 2004. There are 660 students and 101 teachers and administrators. The school comprises three academic departments: primary department (38 teachers), international secondary department (31 teachers) and bilingual secondary department (24 teachers)[2]. Each department has its own academic director. There are six administrators, including the head of school, who support school-wide administration. Aiming to promote collaboration among teachers, the school organizes weekly collaborative meeting for each academic department. In addition, the primary department has its own grade meetings horizontally and subject meetings vertically. The other two secondary departments conduct subject-based weekly meetings. The primary department offers co-teaching system with co-homeroom teachers (one overseas and one host country teachers) while secondary departments provide single subject teacher with an in-class ESL support teacher when needed.

School B. The school was founded in 1994. There are 610 students and 68 teachers and administrators with two sections: primary school (31 teachers) and secondary school (34 teachers). Each section has its own principal. The two principals report directly to the head of school. There is one weekly administrative meeting chaired by the school principal and one monthly school-wide meeting chaired by the head of school. To provide flexibility to teachers, there is no fixed meeting timetable. In other words, collaborative meetings are arranged freely and informally by teachers of each grade and subject as needed. In the primary school, there is a teaching assistant to support homeroom teachers in each homeroom class. In the secondary school, ESL classes are offered as separate lessons for some students who are required to take additional language courses.

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[1] The International Baccalaureate (IB) offers a continuum of international education that covers three major programs: Primary Years Program (for age range 3-12), Middle Years Program (for age range 11-16) and Diploma Program (for age range 16-19). As of July 2016, there are 4,527 schools offering IB programs around the world. The programs have been offered to more than 1 million students worldwide as of 2017.

[2] The distinction between international secondary department and bilingual secondary department is that the former prepares students for overseas study after graduation and the latter prepares students for national entrance examination to enter the universities in the Taiwan.

Data Collection

Two rounds of data were collected from each case school. First, data about the "whole school" network was gathered from the 101 teachers from school A and the 68 teachers from school B by means of a network survey. The survey for network data collection was designed using the combination of social network survey design from Marsden (2011), the concept of depth and intensity of teachers' interactions (Little, 1990), and social network dimensions in school from Coburn, Russell, Kaufman, and Stein (2012). The response rate of the network survey was 98% with less than 1% missing value from school A and 88.2% response rate with less than 1% missing value from school B.

Second, after gathering network data, the survey that was designed to measure the extent to which the school community embraces the characteristics of PLCs was distributed. The survey was designed using the combination of elements from the existing validated survey instrument used by Louis, Leithwood, Wahlstrom, Anderson, and Michlin (2010). The content validity ratio of the survey items was examined. The response rate of the PLCs survey was 98% with 3% the missing value from school A and 88.2% response rate with 13.5% missing value from school B.

Prior to each stage of data collection, the purpose of research and process were introduced and explained to teachers. Participating teachers signed consent forms that explained how the research would be conducted. As social network analysis attempts to collect data on relationships among all teachers in the school, the process to ensure participants' confidentiality is crucial. Therefore, upon obtaining the network visual map from UCINET social network analysis software we converted all participants' names to pseudonyms prior to the initial stage of data analysis. We then used pseudonyms throughout the study to minimize possible identification of participants.

In a final stage, in-depth semi-structured interviews of selected informants were conducted. The interviews were audiotaped and transcribed. The interviews were used to examine teacher's network behavior, determine how network position affects teachers' roles in each school community and to gauge the level of PLC in four dimensions (i.e., organizational learning, shared responsibility, reflective dialogue and deprivatized practice). In total, interviews with 25 teachers were conducted in School A and 18 teachers in School B. The interviewees included conversations with the head of school, heads of department, program coordinators, identified teacher leaders and those who closely interact with them.

Measures

Network Measures. To identify individual teachers' professional interactions, the study asked the participants to list the full names of their colleagues in the school that they "ask for instructional advice, information, or expertise related to their teaching". Drawing from this network measure, this study employed a group level of analysis that includes all members in the school as a unit of analysis. This study used two network properties: average degree and closeness centralization of the whole network. The average degree of the whole network was employed to compare levels of cohesiveness of multiple networks, consisting of different numbers of actors. A network with a high value of "average degree" is a network that has a large amount of member interaction. Closeness centralization represents the degree to which actors are close to other actors in terms of geodesic distance within a group. That is, if only a few particular actors are easily reached in/out by the rest of the other actors in terms of geodesic distance, those particular actors are placed into the center of the group network (i.e., more centralized) and the network map becomes less homogenous in terms of geodesic distance (Wasserman & Faust, 2007).

PLC Measures. To compare the PLC engagement of teachers between the two schools, we used the validated survey questionnaire developed by Louis et al. (2010). However, given this survey instrument was developed from western contexts, we conducted Content Validity Test.[3] Specifically, the survey was distributed to 11 teachers who have been in School A for more than four years with minimum six years of teaching experience. See Appendix 1 for details about the measures.

Findings

The Network of Teacher Professional Interactions: The Structural and Functional Features of Teacher Leadership

Data derived from network survey serves two purposes. First, whole network properties (i.e., average degree and closeness centralization) were used to examine overall professional

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[3] According to Lawshe (1975, p. 564), judgment from experts, here as experienced teachers, would assist in demonstrating that the survey items are appropriately sampled the content domain. Content Validity Ratio (CVR) was calculated for each survey question. Based on Lawshe (1975, p. 568), a minimum CVR value of 0.59 is required to satisfy the five percent level when there are 11 experts rating the questionnaire. Only 3 out of 23 items in the survey did not meet the required minimum CVR value of 0.59 (See Appendix 1).

interactions among teachers in each school. Table 1 shows that School A possesses higher value of average degree in comparison with School B. A school with more professional interactions can be viewed as a community with collaborative activities among members. Therefore, when School A demonstrates a higher level of average degree in comparison to School B, it can be reasonably said that professional interactions among teachers in School A occur more frequently than school B. In addition, School A shows a higher percentage of closeness centralization in comparison with School B, suggesting that it is easier for teachers to reach the lead teachers in School A as the teacher leaders tend to be located closer to the center of the school network (see Figures 1 and 2).

Table 1: Network properties

	School A	School B
Average Degree	3.614	2.971
Closeness Centralization	31.72%	25.14%

Second, a visual map and centrality values[4] were used to guide a selection of key informants in each school. This is to qualitatively understand an association between identified teacher leaders and their roles in the school professional networks. Specifically, teacher leaders tend to be those who possess high betweenness centrality[5] (brokering role), high indegree centrality[6] (mediating role), outdegree centrality[7] (participative role) and closeness centrality (forging role)[8]. Consequently, the interviews with identified teacher leaders and those who frequently interact with them were carefully examined.

Figure 1 shows the visual map of School A network. There are a number of actors who are positioned in the center of the whole school network. In addition, in each academic department (distinguished by shapes), there are some teachers who are close to the center of

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[4]Centrality is the degree to which one network member interacts with his/her peers.
[5]The degree to which a particular teacher lies 'between' the various other points in the network (Scott, 1991, p. 89). In other words, it is regarded as a measure of the degree to which one actor can control the flow of information.
[6] The degree to which individual teacher is being sought or approached by their professional colleagues (Wasserman & Faust, 2007).
[7]The degree to which individual teacher actively seeks instructional advice/information from certain teachers in the network (Wasserman & Faust, 2007).
[8]The degree to which one individual teacher gets to other teachers along the shortest path in the network (Wasserman & Faust, 2007).

school network and demonstrate more incoming and outgoing ties around them. Many ties are <mark>relatively thick.</mark> These teachers who are close to the center are identified as teacher leaders in the school.
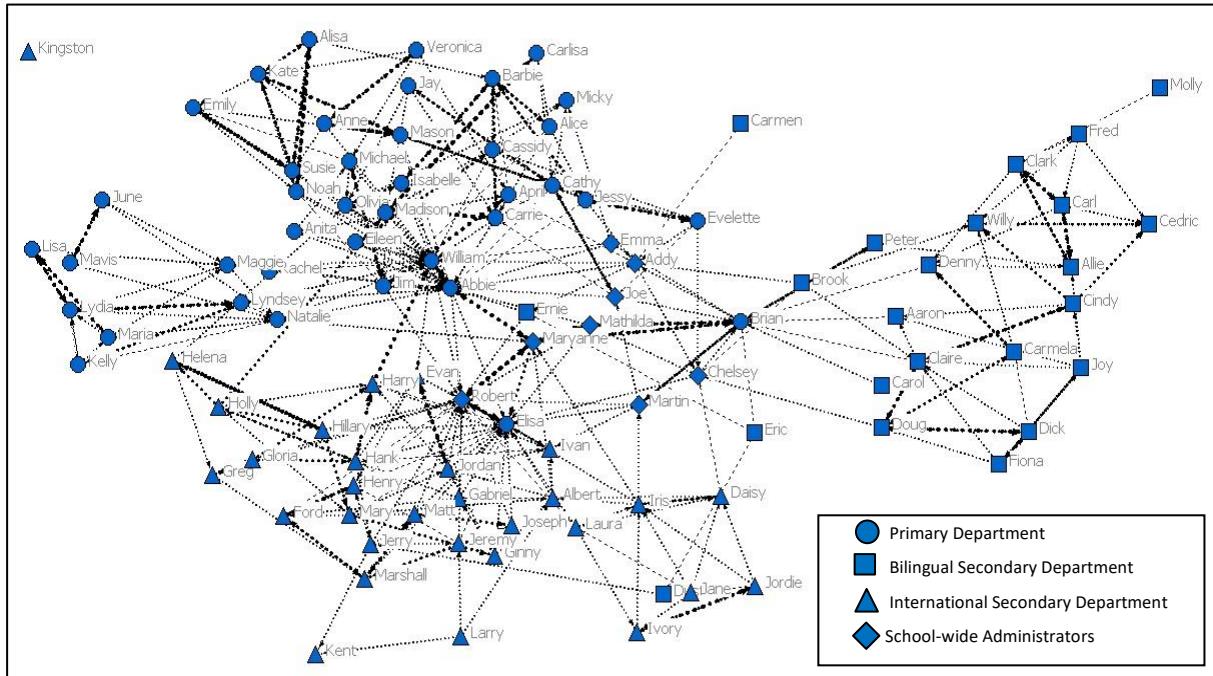
Figure 1: Visual Map of School A

Figure 2 represents the visual map of School B network. Compared to School A, this network has relatively less ties with a few dominated key members at the center of the network. The majority of actors possess loose and thin ties. However, there are only a few focal actors who are close to the center and with relatively thick ties. These teacher leaders appear to dominate the relationships in the network.
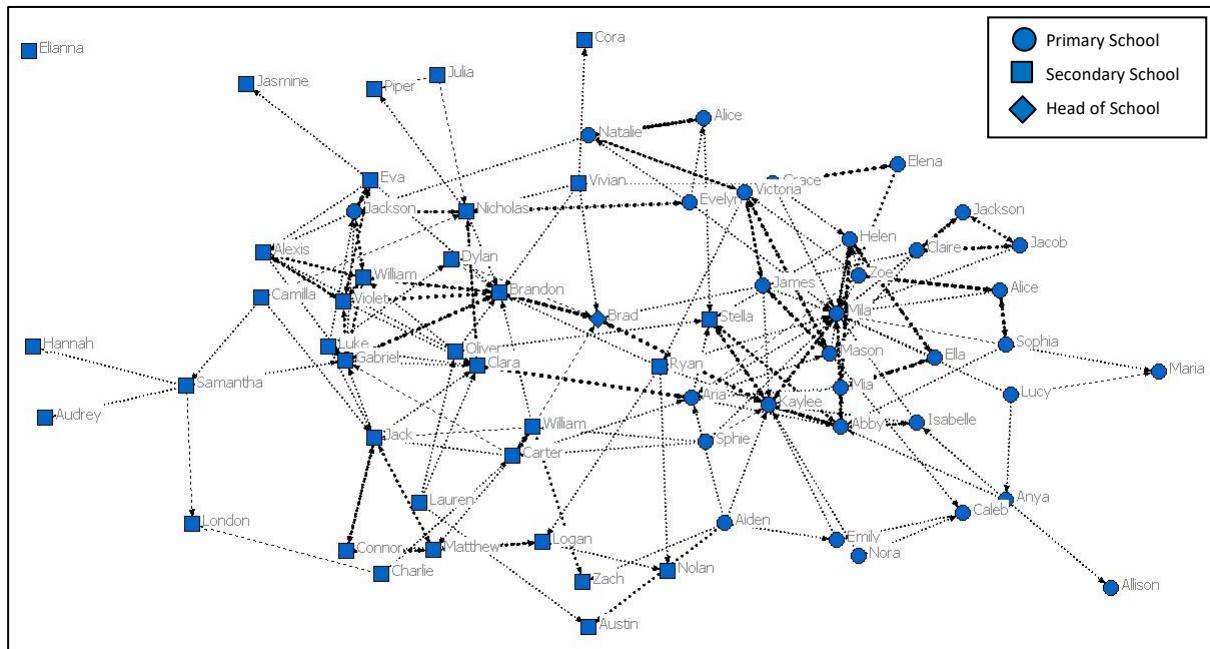
Figure 2: Visual Map of School B

PLC Engagement from a Structural and Cultural Perspective of Teacher Collaboration

We averaged out the multiple items in each PLC domain in order to conduct a MANOVA test; Cronbach alphas were .700 (OL), SR (.569), RD (.680), and DP (.808).

As descriptive statistics in Table 2 indicate that teachers in both schools were more actively involved in OL, SR, and RD (given the averages of those dimensions) than DP. In other words, the result indicates that teachers engaged in activities related to OL, SR, and RD "quite often" given that their activities were measured on a 4-points Likert scale. In terms of DP, teachers in both schools responded that their engagement in DP rarely or sometimes happened.

In terms of comparison, teachers in School A were more likely than their counterparts in School B to engage in PLC activities. Specifically, teachers in School A showed higher levels of engagement across the four components of PLC, compared to their counterparts. Teachers in School A were particularly more involved in OL than their counterparts in School B. They also showed higher levels of engagement in SR, RD, and DP.

Table 2 Descriptive Statistics

	1 = School A 2 = School B	Mean	Std. Deviation	N
Organizational Learning (OL)	1.00	3.5899	.28781	88
	2.00	3.3736	.26399	55

12

	Total	3.5067	.29733	143
Shared Responsibility (SR)	1.00	3.6960	.33573	88
	2.00	3.5318	.36342	55
	Total	3.6329	.35455	143
Reflective Dialogue (RD)	1.00	3.5710	.39200	88
	2.00	3.4318	.38626	55
	Total	3.5175	.39434	143
Deprivatized practice (DP)	1.00	2.4972	.68909	88
	2.00	2.3091	.76371	55
	Total	2.4248	.72191	143

The different levels of PLC between the two schools seemed to be associated with the structure and policy of case school. This was supported by the interview data. The conversations with a number of teachers in School A have led to an understanding that teachers in School A collaborate and interact greatly. A young Humanities teacher presented his understanding of collaboration, "Collaboration is not just taking one person's ideas and using them yourself. It's about working together to come to a common understanding of where things should be (A21)." His statement echoes the routines how teachers in School A interact.

In terms of structure, at school A, the primary department is operated under co-teaching system. There are two pairs of teachers in each grade level, constituting four teachers per grade. Therefore, this structure forms a small team and its members regularly plan, teach and reflect upon their work collaboratively. One of the grade 4 teachers elaborated her routine planning process with her peers as a constant learning cycle.

> Often times, we will plan our unit, and then we will discuss the first line of inquiry - how we are going to introduce that and we will have a few ideas of activities. We will put it on the planner and maybe in our grade team. One of our classes will start first because of the schedule. And then usually after that there will be time in the office or just in the hallway where there will be a kind of reflection on how did it go or some feedback to the other class, or other team members. Next, we will adjust our plan, it's like almost a second experiment, or maybe we change something a little bit that is not on the planner. We will implement that. It just always goes round and round. And we will also think as

a whole for next year. Maybe, we need to do that way, or not do this again. With these team members, learning…yes, it just goes round and round. That needs to be constant… I feel like it's a big circle where we always talk together and we report back to each other (A09).

While teachers in School A described their workplace interactions enthusiastically, the working climate in School B appeared to be different. One senior primary teacher who had been in School B for 3 years shared how much she longs for collaborative meeting time with her colleagues.

Here we will be asked to be involved in certain developments at the school; either taking part in organizing activities or curriculum development. I think we are busy for the sake of getting busy. It's not busy in a sense of promoting our personal growth or professional development. In my old school, we collaborated a lot. Lots and lots of collaboration happened there but I don't see it here. For example, people send an e-mail telling you what to do but in the meeting on Wednesday, the same thing is brought up in the meeting to discuss. We don't need to do so. The time can be used wisely for professional development (B07).

At the policy level, weekly collaborative planning time is scheduled in School A for one afternoon (three hours) outside of teachers' teaching timetable. This is in contrast to the policy established in school B in which collaboration time is freely organized in accordance to teachers' needs. In other words, there is no fixed planning schedule during school hours. Ideally, this policy is supportive in a way that it offers more flexibility of time usage to teachers. However, in practice, teachers tend not to gather together unless there are co-organized activities among them as witnessed in the interview with grade 4 teacher in School B, "We meet and discuss when we have to. Usually, it is when we organize co-activities between classes or events within department (B05)."

School B also schedules weekly meeting time for administrative affairs such as announcements, special events, school activities, assessment reports, appraisal processes, and curriculum development plans. One primary school teacher shared her view, "we have a weekly meeting on Wednesday from 2:30-4:40. I think there is no substance in our discussion. No

professional development. You may ask the primary teachers. Nine out of ten would tell you that it's "phew" (rolled her eyes)… most of the time, it is only relevant to administration (B13)." The above findings reveal a broad picture of how teachers in School A and B spend their time and how they are involved or even required to be involved in the community.

In the following sections, we examine four dimensions of PLCs (i.e., organizational learning, shared responsibility, reflective dialogue, and deprivatized practice). ANOVA results show that the differences in PLC engagement between School A and School B were statistically significant. In other words, teachers in School A engaged more actively in OL: $F(1, 141) = 20.36$ ($p=.000$), SR: $F(1, 141) = 7.60$ ($p=.007$), and RD: $F(1, 141) = 4.32$ ($p=.040$) than teachers in School B. However, there was no statistical difference in DP between the two schools ($F(1, 141) = 2.32$ ($p=.130$), suggesting that DP was the least engaging PLC dimension of teachers in both schools commonly.

The interview data echo consistent findings with the above ANOVA test. In both schools, teachers demonstrate their willingness to support peers and feel that they share parts of the school community (i.e., shared responsibility). An interview with a CAS coordinator in School B reveals how teachers at all levels in the school possess shared vision and responsibilities to connect the CAS programme[9] with local community:

> I began my role from not being in a formal CAS coordinator position. I was a primary classroom teacher and believe strongly how service should be an important part of student learning. My role began informally when teachers looked for me and asked for my advice or support. I tried as much as I can to set a framework that is compatible with teacher's lesson plans. Gradually, school gave me 20% released time from my class to work on this and eventually I took a full role as a CAS coordinator. What I enjoy the most is that we are on the same page . . . that service is our shared mission. This CAS coordinator role is interesting because we do have a network of CAS advisors that I supervise and I am responsible for training and supervising them. But at the same time, in the end, if the teacher is not successful as a CAS advisor, I am also there to step

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[9]Creativity, activity, service (CAS) is one of the three essential elements that every student must complete as part of the Diploma Programme (DP).

in and work directly with students. It's not only one teacher's responsibility, it's ours. So, I do make space for them (B03).

In School A, a similar sense of shared responsibility is evident among teachers. When focusing on how teachers share and reflect through discussions (i.e., reflective dialogue), a grade 2 teacher in School A described how she interdependently works with her co-teacher:

I would have these ideas and I would express them to her, she was able to give me some advice if she thought it would work or wouldn't and show how to improve it or what obstacles we might face if we try to implement it. The two of us have always been like that. We worked together very collaboratively. Uhm…we shared our resources, we shared our ideas. We were often doing the same activities together. From our discussions, she would offer advice, she would give suggestions or come up with problems that maybe I hadn't considered before. And that's why the two of us sharing those ideas, working collaboratively; we can come up with better learning engagements. If I were to do these things by myself, then I would have to try them first, go to the process of oh...ok…reflecting on the results of the lesson and then trying to do better next year. That process is a lot longer than if you are talking with someone and sorting out the problem before you do it the first time when your vision of that activity is limited. You don't need to make that many revisions (A22).

In a similar vein, one Humanities teacher in School A elaborated his collaboration with his team during the weekly subject meeting:

To say like, in grade nine, we have three teachers, A18, A31 and myself. So, for example, right now we are doing a human rights unit. Originally, we begin to talk about North Korea. But during this time, you know, in Ukraine quite a crisis has happened. You know I bring it up to the boys, look we should be talking not just about North Korea but let's bring in Ukraine. You know, A18 he finds the resources and he shares it with us and A31 creates questions about it and all three of our classes we are going to look at it together. It's a bit different but you know similar materials and similar direction (A07).

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In the secondary school section of School B, there is a subject meeting time with a significant focus on curriculum and program development. Specifically, some selected teachers are assigned to take part in subject curriculum development together with subject chairs. That being said, if teachers are not members of curriculum development team, they are not obliged to join the planning time. One teacher described, "I told my friends in other schools, I miss that kind of dialogue. The dialogue that I can talk and share about my teaching and aim on improving what I am currently doing." In addition, School B seems to designate teachers' time to accomplish the school-wide annual goals such as completion of curriculum handbook, student well-being program and pays less attention to day-to-day planning. One experienced teacher shared her view:

> I attended EARCOS[10] in March. I think they give about UDS1,200 per year which is quite generous. Unfortunately, here, there is no system in place for teachers to share after the workshop. I am a workshop leader. I have just presented my workshop at EARCOS this year. It's my passion that I would like to organize the workshop and guide others what and how to design their teaching. I talked to [primary school principal] many times. I can do this and I can present that. I can lead group discussions after teachers implement the strategies in their class. The response was, this is a good idea but that has never happened (B08).

As shown in ANOVA test, DP was the least engaging PLC dimension of teachers in both schools. In other words, peer coaching and classroom observation (i.e., deprivatized practice) are the least observable practice in both schools. A few examples from the interviews explain that some teachers are reluctant to open up their classroom with a fear that their teaching boundary will be intruded. One Mathematics teacher in School A said, "Teachers are fairly territorial people. Some of them are really fiercely independent. So, they think of their classroom as like their castle (A12)." Another teacher in School A presented a cultural

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[10]The East Asia Regional Council of Schools (EARCOS) is an organization of 158 member schools in East Asia. These schools have a total of more than 132,000 pre-K to 12th grade students.

perspective, "You know…this is tricky, I think that some of it comes from the school culture, some of it might come from the fear that...uhm…people are gonna evaluate and rank you. So, sometimes people resist that idea (A20)."

The majority of teachers in both schools expressed their concern with the limited time that they have during the day. In addition, their teaching timetable does not allow them to be available at the same time to observe their peers in classrooms.

> Basically, you choose the time that is most convenient for you. Timing is a factor. I mean…I wanted to observe A19 a number of times and he came to visit me. It took us about four weeks to find the time when he was available and I was available because we were just so busy. Schedule makes it difficult… like… I can't see some teachers because they are always teaching when I am (A03).

> I have been teaching here for 6 years and I find that…yeah…we are so busy. In between classes…teachers…we sometimes talk about our experiences. However, to observe classes, and that is really good. I mean…for us…it is one way of doing professional development but we don't have a lot of time to do that. We don't spend time going into others' classrooms (B14).

A MANOVA test confirmed the results from the tests of between-subjects presented above; teachers' engagement in OL, SR, and RD between the two schools differs significantly. Including Pillai's Trace and other test statistics were $p = .001$.

Table 3. MANOVA Results[11]

Effect		Value	F	Hypoth-esis df	Error df	Sig.
Intercept	Pillai's Trace	.995	7059.434	4.000	138.000	.000

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[11]Given the different sample sizes of the two groups, we checked Box's test, suggesting that the assumption of equality of covariance matrices were met (p = .697). Leven's test of equality of error variances was also met across the four domains of PLC (i.e., p-values were much higher than .05).

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	Wilks' Lambda	.005	7059.434	4.000	138.000	.000
	Hotelling's Trace	204.621	7059.434	4.000	138.000	.000
	Roy's Largest Root	204.621	7059.434	4.000	138.000	.000
School_ID	Pillai's Trace	.133	5.271	4.000	138.000	.001
	Wilks' Lambda	.867	5.271	4.000	138.000	.001
	Hotelling's Trace	.153	5.271	4.000	138.000	.001
	Roy's Largest Root	.153	5.271	4.000	138.000	.001

Based on the significant MANOVA result, we conducted a discriminant function analysis in order to further tease out the magnitude of each of the three domains of PLC that "discriminates" between the two schools. The standardized discriminant function coefficients, equivalent to relative contributions of the three PLC domains to the difference between the two schools, indicated that OL (.875) made a greater difference than other two domains – SR (.164) and RD (.109) – in the PLC difference between the two schools. The relationships were statistically significant (Wilks's lambda=.864, *df* (3), $p = .000$). In short, it was OL that made the two schools most distinguishable in terms of teachers' PLC engagement.

The above data signal the differences in *teachers' culture* of professional learning, in addition to the differences in policies and structures between the two schools noted earlier. In School A, teachers continuously and collectively act on acquired knowledge in relation to instruction (i.e., organizational learning). However, in School B, teachers have limited opportunities to share and exchange resources.

In terms of recruitment, there is a required minimum 3 years of teaching experience imposed in School B recruitment policy while there is no such requirement in School A. It can be said that on average teachers in School A are less experienced than their counterparts in School B. From the interviews, we sense that younger age of teaching experience may also drive a motivation to collaborate. A teacher with 2 years teaching experience in School A shared his way of learning.

> Uhm… write down note, think about…. and just try to process it, how does this work? If I'm learning about IB, what does the IB want? How can I take what the IB wants and explain it to my students in vocabulary and concepts that they understand? You know… basically, just understand it…try to understand the message what is the message that IB tries to give us? How can I relate that to the kids? How can I develop the skills that IB wants? And then, do it and then

reflect, everyday. Oh my goodness, that didn't work at all. Kids didn't get it, alright, try something else. Talk to other teachers, get feed back. Try something new. Yes, that works, OK, great. Share it with other teachers…(laughed)...right? It's daily. It's endless, right? This is what being teacher is all about. No two days are the same. I can come up with a great lesson plan and this year, they get it, they understand it. The next year, I do the same lesson, students go…what are you talking about. I have no idea because they have different interest. They have different learning style. So, change. Come up with the new strategy. If it works, great! Alright, awesome! You know… and then reflect on that. So, the way you teach, the same content to different kids, change day to day, year to year (A16).

The procedure and culture of decision-making also seemed to affect how teacher leadership can be nurtured in the school community. In School B, an anonymous teacher spoke about the School B's leadership team:

They like to keep their fingers on everything. There is a weekly meeting that three of them (head of school, primary school principal and secondary school principal) will discuss and make decisions. There are also a few people such as subject chairs or coordinators who will be invited to join occasionally. We feel that the school puts more weight of decision towards secondary school. Often times, decisions have been made prior to formal meetings. They will discuss ideas with their team informally and here comes the decision. There are many things that I want to do but I felt like they need to be filtered first and I have never been in an impression that I could do things without that filtering. I just feel like, even with quite a small thing, I would probably still have to…yeah. I think because they have been here for quite a long time. (B16).

Discussion

This study confirms that when schools establish policies and structures to promote collaborations, teachers will have more opportunities to engage in PLC practices and potential teacher leaders will emerge. This is evident in School A in which the school sets collaborative planning time for the whole department and each subject discipline. In terms of structure, the

primary department in School A offers a co-teaching system and demonstrates a dense network with many strong ties among teachers. This structure confirms that team-teaching is a vehicle for greater instructional interaction among teachers (Cohen, 1981). In addition, School A has many members in its leadership team that includes administrative members and academic members. The composition of the leadership team allows formal authority and responsibilities to be distributed across the school's networks. In contrast, School B has a leadership team that comprises three members who are involved in both administration and academic-related affairs. While nurturing teacher leadership can be set as a goal in schools, in practice, it can be hard for those who possess formal roles to provide the conditions that will allow teacher leadership to be developed if they are not reflective of their own leadership practices and how these can promote or constrain teacher leadership. Despite School B's flat organizational structure with one head of school and two principals of school sections, when decisions tend to be made within a small group of formal leaders the flat structure does not encourage teacher leadership. As Harris' (2003) has observed, in such situations formal leaders are unable to relinquish their power to others with the fear of losing control.

Contrived collegiality (Hargreaves, 1994) occurs when certain interactions among colleagues are imposed. In School B, the school required selected teachers to take part in school curriculum development. By restricting the collaborative activity to teachers selected by the administration, teachers who would otherwise have willingly engaged in collaborative work were denied the opportunity. However, not all "contrivances" result in negative outcomes. For example, in School A, the "imposed" collaborative planning time promoted collaboration.

Reflection on our findings from a network perspective has led us to posit four types of teacher leadership (See Figure3). There appears to be substantial PLC activity in School A. This is evident in the school visual map and average degree of the network. Specifically, more connections represent a relatively high level of collaborative activities among teachers. School A's network also reveals a number of focal figures who are distributed around the center of the network. These figures are teacher leaders who contribute to planning and establishing policies and structure that further enhance PLC practices (e.g., co-teaching, collaborative planning schedule, etc.). This *distributed network with focal points produces distributed teacher leadership* in the school as presented in Figure 3.

Derived from network properties and the visual map, School B enjoys relatively fewer connections across members. This might stem from the fact that school policies and structure are relatively rigid and hence reduce the opportunities for teachers to explore their own

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leadership role. This less connected network is dominated by a few key actors who are located close to the center of the school network (i.e., Balkanized network). We call this *oligarchic teacher leadership.*

Based on average degree of network interaction and "closeness centralization" two additional types of teacher leadership are proposed. *Non-centric teacher leadership* represents a network with dense connections across members but with only a few key members who are located randomly in the school network. *Weak teacher leadership* refers to the network with loose connections across members and only a few key members who are located randomly across the school network.
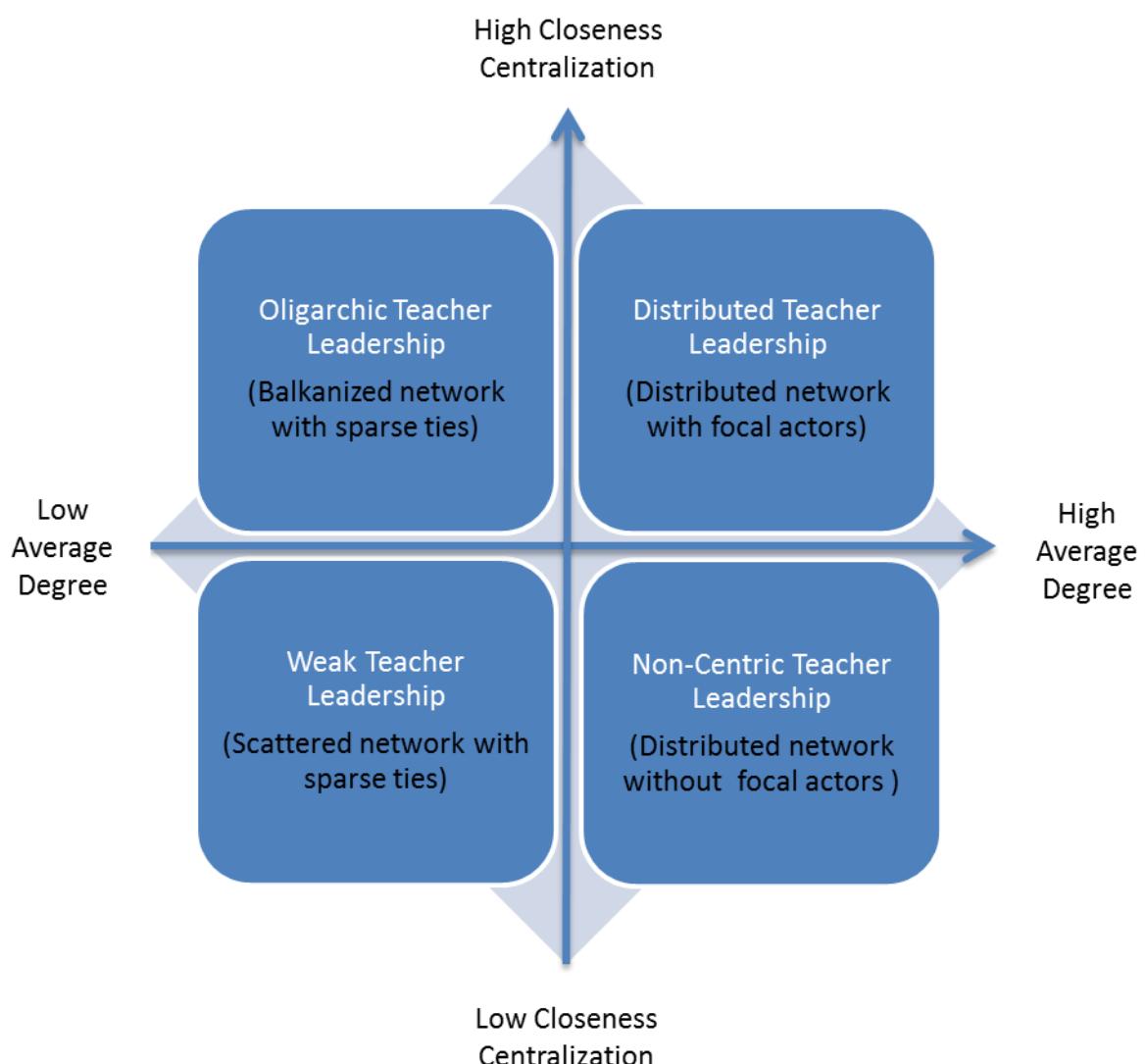
High Closeness
Centralization

	Oligarchic Teacher Leadership (Balkanized network with sparse ties)	Distributed Teacher Leadership (Distributed network with focal actors)	
Low Average Degree			High Average Degree
	Weak Teacher Leadership (Scattered network with sparse ties)	Non-Centric Teacher Leadership (Distributed network without focal actors)	

Low Closeness
Centralization

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Figure 3: Typology of Teacher Leadership from a Network Perspective

Implications for Future Research

This study provides a number of implications for research in the field. First, the study offers an empirical link between teacher leadership and PLC. Using social network analysis the study visualizes the structural and functional features of teacher leadership. These features are complemented with narrative data shedding light on the cultural dimensions of teacher leadership. More importantly, the study shows how teacher leadership captured by both network and narrative data shapes teachers' engagement in PLC as measured by the validated survey data. The different types of teacher leadership are clearly associated with the level of teachers' engagement in PLC in each case school. This suggests that teacher leadership is at the core of building PLCs in schools as teacher leadership is premised upon teachers working in collaboration to learn with and from each other (Harris, 2003).

Second, the study shows that the formation of different types of teacher leadership is influenced by school policies and structures such as co-teaching and timetabling. Specifically, in terms of co-teaching, the finding suggests that working in collaborative situations exposes teachers to new ideas, to working on problems collectively and to learning from the very people who understand the complexity of their work best – their own colleagues (Lieberman, 1988). When teachers learn from one another through mentoring, observation, peer coaching and mutual reflection, the possibilities of generating teacher leadership are significantly enhanced (Little, 1995). By building an appropriate infrastructure to support collaboration for mutual learning, teachers can improve their practice through developing and refining new instructional methods. In addition, this study demonstrates that released (or secured) time is considered as one of the major conditions that allow forms of teacher leadership to flourish (Harris, 2003; Ovando, 1994; Louis et al., 1996). Schools may set aside time for teachers to meet, collaborate, plan and discuss. In addition, fostering collective reflection and action has been seen as a foundation to prepare teachers for collective school leadership (Kahne & Westheimer, 2011).

Third, consistent with prior studies, this study shows that leadership practice particularly about decision-making procedures and culture is also a factor that appears to shape different types of teacher leadership. To promote teacher leadership, appropriate policies and mechanisms must be in place to encourage shared decision-making and promote collaboration between administrators and teachers (Rasberry & Mahajan, 2008; Harris, 2003). That is,

leadership in school is perceived as a team effort with changing in roles and relationships of teachers and principals.

Fourth, all aforementioned findings resonate with previous work on teacher leadership in local schools. Therefore, it can be said that teacher leadership in international schools appears to share similar issues and characteristics.[12] Of course, given the small-scale of our study, these findings are primarily applied to our research context. We thus suggest that further study is required to determine the transferability of these findings.

Finally, this study contributes to the conceptualization of teacher leadership by proposing a typology of teacher leadership from a network perspective. The four types of teacher leadership (i.e., distributed, oligarchic, non-centric, weak teacher leadership) may be useful in understanding teacher leadership both in practice and further research.

References

Ackerman, R., & Mackenzie, S. V. (2006). Uncovering teacher leadership. *Educational Leadership, 63*(8), 66-70.

Ball, S. J. (1981). *Beachside comprehensive: A case study of secondary schooling.* New York: Cambridge University Press.

Ball, S. J., & Lacey, C. (1984). Subject disciplines as the opportunity for group action: A measured critique of subject subcultures. In A. Hargreaves & P. Woods (Eds.), *Classrooms and staffrooms*. Milton Keynes, England: Open University Press.

Ball, S. J., & Lacey, C. (1995). Revisiting subject disciplines as the opportunity for group action: A measured critique of subject subcultures. In L. S. Siskin, & J. W. Little (Eds.), *The subjects in question: Departmental organization and the high school* (pp. 95–122). New York: Teachers College Press.

Bergeron, L., & Dean, M. (2013). *The IB teacher professional: Identifying, measuring and chracterizing pedagogical attributes, perspectives, and beliefs*. Retrieved from Bethesda, Maryland, USA:

Borgatti, S. P., Everette, M. G., & Johnson, J. C. (2013). *Analyzing social networks*: SAGE Publications Limited.

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[12]On another note, the low engagement of teachers in "de-privatized practice" in both schools, despite the different types of teacher leadership being exercised in the two schools, suggests that teachers in international schools in East Asiaare also conventional in terms of that particular PLC practice, which is similar to many of teachers in local schools in East Asia.

Lin, W., Lee, M., & Riordan, G. (2018). The role of teacher leadership in professional learning community (PLC) in International Baccalaureate (IB) schools: A social network approach. *Peabody Journal of Education. 93*(5), 534-550.

Bryk, A. S., Camburn, E., & Louis, K. S. (1999). Professional community in Chicago elementary schools: Facilitating factors and organizational consequences. *Educational Administration Quarterly, 35*(5), 751-781. doi:10.1177/0013161x99355004

Coburn, C. E., Russell, J., Kaufman, J. H., & Stein, M. K. (2012). Supporting sustainability: Teachers' advice networks and ambitious instructional reform. *American Journal of Education, 119*(1), 137-182. doi:10.1086/667699

Cohen, E. G. (1981). Sociology looks at team teaching. *Research in Sociology of Education and Socialization*, *2*, 163–193.

Crossan, M., Lane, H., & White, R. (1999). An organizational learning framework: From intuition to institution. *Academy of Management Review, 24*(3), 522-537.

Daly, A. J. (Ed.) (2010). *Social network theory and educational change*. Cambridge, Mass.: Harvard Education Press.

Danielson, C. (2006). *Teacher leadership that strengthens professional practice*. Alexandria, VA: ASCD.

Day, C., & Harris, A. (2003). Teacher leadership, reflective practice and school improvement In K. Leithwood & P. Hallinger (Eds.), *Second international handbook of educational leadership and administration*. Dordrecht: Kluwer Academic.

Gladder, B.A. (1990). C*ollaborative relationships in high schools: Implications for school reform.* Unpublished doctoral dissertation, University of Oregon, Eugene.

Gronn, P. (2000). Distributed properties: A new architecture for leadership. *Educational Management & Administration, 28*(3), 317-338.

Gronn, P. (2002). Distributed leadership. In K. Leithwood & P. Hallinger (Eds.), *Second international handbook of educational leadrship and administration* (Vol. 2, pp. 653-696). Dordrecht: Kluwer Academic Publishers.

Grossman, P. L., & Richert, A. E. (1996). Building capacity and commitment for leadership in preservice education. *Journal of School Leadership, 6*(2), 202-210.

Grossman, P. L., & Stodolsky, S. S. (1995). Content as context: The role of school subjects in secondary school teaching. *Educational Researcher, 24* (8), 5–11, 23.

Hargreaves, A. (1991). Contrived collegiality: The micropolitics of teacher collaboration. In J. Blasé (Ed.). *The politics of life in schools: Power, conflict, and cooperation* (pp. 46–72). Newbury Park, CA: Sage.

Hargreaves, A. (1994). *Changing teachers, changing times: Teachers' work and culture in the postmodern age.* New York: Teachers College Press.

Lin, W., Lee, M., & Riordan, G. (2018). The role of teacher leadership in professional learning community (PLC) in International Baccalaureate (IB) schools: A social network approach. *Peabody Journal of Education. 93*(5), 534-550.

Harris, A. (2003). Teacher leadership as distributed leadership: heresy, fantasy or possibility? *School Leadership & Management, 23*(3), 313-324.

Hoyle, E. (1982). Micropolitics of educational organizations. *Educational Management, Administration and Policy, 10,* 87–98.

Iannaccone, L. (1975). *Educational policy systems.* Fort Lauderdale, FL: Nova University Press.

Kahne, J., & Westheimer, J. (2011). A pedagogy of collective action and reflection: Preparing teachers for collective school leadership. In E. B. Hilty (Ed.), *Teacher Leadership: The "new" foundation of teacher education* (pp. 145-158). New York: Peter Lang.

Lawshe, C. H. (1975). A quantitative approach to content validity. *Personal psychology, 28*, 563-575.

Leithwood, K., & Louis, K. S. (1998). *Organizational learning in schools.* Lisse, [Netherlands] Swets & Zeitlinger Publishers.

Levin, B., & Young, J. (1994). *Understanding Canadian schools.* Toronto, ON: Harcourt Brace.

Lieberman, A. (1988). Expanding the leadership team. *Edcuational Leadership, 45*(5), 4-8.

Lieberman, A. (1995). Restructuring schools: The dynamics of changing practice, structure, and culture. In A. Lieberman (Ed.), *The work of resrtucturing schools* (pp. 1-17). New York: Teachers College Press.

Little, J. W. (1990). The persistence of privacy: Autonomy and initiative in teachers' professional relations'. *Teachers college record, 91*(4), 509-536.

Little, J. W. (1995). Contested ground: The basis of teacher leadership in two restructuring high schools. *Elementary school Journal, 96*(1), 47-73.

Lee, M., Hallinger, P., & Walker, A. (2012). A distributed perspective on instructional leadership in International Baccalaureate (IB) schools. *Educational Administration Quarterly*, *48*, 664-698.

Louis, K. S. (2006). Changing the culture of schools: professional community, organizational learning and trust. *Journal of School Leadership, 16*(4), 477-489.

Louis, K. S., Kruse, S., & Raywid, M. A. (1996). Putting teachers at the center of reform: Learning schools and professional communities. *National Association of Secondary School Principals. NASSP Bulletin, 80*(580), 9-9.

Louis, K. S., Kruse, S. D., & Bryk, A. S. (1995). *Professionalism and community: Perspectives on reforming urban schools.* Thousand Oaks, CA: Corwin.

Lin, W., Lee, M., & Riordan, G. (2018). The role of teacher leadership in professional learning community (PLC) in International Baccalaureate (IB) schools: A social network approach. *Peabody Journal of Education. 93*(5), 534-550.

Louis, K. S. & Lee, M. (2012, April). *Does school culture matter? Defining and measuring a strong school culture linked to student learning.* Presented at the Annual Conference of the American Educational Research Organization, Vancouver, British Columbia, Canada.

Louis, K.S. & Lee, M. (2016). Teachers' capacity for organizational learning: The effects of school culture and context. *School Effectiveness and School Improvement. 27*(4), 534-556.

Louis, K. S., Leithwood, K., Wahlstrom, K., Anderson, S. A., & Michlin, M. (2010). *Learning from leadership: Investigating the links to improved student learning: Final report of research findings.* Retrieved from New York:

Louis, K. S., Marks, H. M., & Kruse, S. (1996). Teachers' professional community in restructuring schools. *American Educational Research Journal, 33*(4), 757-798. doi:10.3102/00028312033004757

Marsden, P. V. (2011). Survey methods for network data. In J. Scott & P. J. Carrington (Eds.), *The SAGE handbook of social network analysis* (pp. 370-388). London: SAGE Publications Ltd.

McCormick, R., Fox, A., Carmichael, P., & Procter, R. (Eds.). (2011). *Researching and understanding educational networks.* London; New York: Routledge.

Merz, C., & Fuhrman, G. (1997). *Community and schools: Promises and paradox.* New York: Teachers College Press.

Nappi, J. S. (2014). The teacher leader: Improving schools by building social capital through shared leadership. *Principal's Research Review, 9*(6), 1-6.

Ogawa, R. T., & Bossert, S. T. (1995). Leadership as an organizational quality. *Educational Administration Quarterly, 31*(2), 224-243.

Ovando, M. (1994). *Effects of teacher leadership on their teaching practices.* Paper presented at the Annual meeting of the University Council of Educational Administration, Philadelphia, PA.Pounder, D. G. (1999). Teacher teams: Exploring job characteristics and work-related outcomes of work group enhancement. *Educational Administration Quarterly, 35*(3), 317-348. doi:10.1177/0013161x99353002

Rasberry, M. A., & Mahajan, G. (2008). *From isolation to collaboration: Promoting teacher leadership through PLCs.* Retrieved from North Calorina: http://www.teachingquality.org

Lin, W., Lee, M., & Riordan, G. (2018). The role of teacher leadership in professional learning community (PLC) in International Baccalaureate (IB) schools: A social network approach. *Peabody Journal of Education. 93*(5), 534-550.

Riordan, G., & da Costa, J. (1998). *Leadership for effective teacher collaboration: Suggestions for principals and teacher leaders*. Paper presented at the Annual Meeting of the American Educational Research Association (San Diego, CA, April 13-17, 1998).

Sandell, M., & Sullivan, K. (1992). Teacher disillusionment and supervision as a part of professional development. Alberta Journal of Educational Research, 38 (2), 133–140.

Scott, J. (1991). *Social network analysis : A handbook*. London: Sage Publications.

Spillane, J. P., Halverson, R., & Diamond, J. B. (2001). Investigating school leadership practice: A distributed perspective. *Educational Researcher, 30*(3), 23-28.

Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. *Journal of Educational Change, 7*(4), 221-258. doi:10.1007/s10833-006-0001-8

Stoll, L., & Louis, K. S. (2007). *Professional learning communities: Divergence, depth and dilemmas*. England: Open University Press.

Wasserman & Faust (2007). *Social Network Analysis: Methods and Applications.* Cambridge: Cambridge University Press.

York-Barr, J., & Duke, K. (2004). What do we know about teacher leadership? Findings from two decades of scholarship. *Review of Educational Research, 74*(3), 255-316.

Lin, W., Lee, M., & Riordan, G. (2018). The role of teacher leadership in professional learning community (PLC) in International Baccalaureate (IB) schools: A social network approach. *Peabody Journal of Education. 93*(5), 534-550.

Appendix 1 PLC survey and CVR Ratio

Variables	Survey items	CVR ratio
Organizational Learning (OL)	OL1: I show initiative to identify and solve problems.	0.64
	OL2: I share current findings in Education with my colleagues.	0.82
		0.82
	OL3: I seek out and read current findings in education.	0.82
	OL4: After attending professional development activities this past year, I discussed what I learned with other teachers in my school who did not attend the activity.	0.82
	OL5: After attending professional development activities this past year, I discussed or shared what I learned with administrators.	1.00
	OL6: After attending professional development activities this past year, I made changes in my teaching practice.	0.82
	OL7: When planning for my lesson, I accept and try new ideas given by my colleagues.	0.64

	OL8: I look for my director for guidance and/or advice to support my teaching.	0.82
	OL9: When my teaching goes wrong, I will try to find reasons and find ways to improve it.	0.82
	OL10: I use student's feedback and learning outcomes to tailor my lesson plan.	1.00
	OL11: To improve my teaching, I feel that there are so many things to learn and I can never stop learning.	
Shared Responsibility (SR)	SR1: I meet with other teachers to collaboratively plan.	0.82
	SR2: I help maintain discipline in the entire school, not just my classroom.	0.09
	SR3: I take responsibility for improving the school outside my own class.	-0.09
	SR4: I feel responsible to help each other improve our instruction.	1.00
Reflective Dialogue (RD)	RD1: In this school year, have you ad conversations with colleagues about what helps students learn best?	1.00
	RD2: In this school year, have you had conversations with colleagues about development of new curriculum?	1.00
	RD3: In this school year have you had conversations with colleagues about the goals of this school?	0.82
	RD4: In this school year, have you exchanged suggestions for curriculum materials with colleagues?	1.00
Deprivatized Practice (DP)	DP1: In this school year, have you visited other teachers' classrooms to observe instruction?	1.00
	DP2: In this school year have you received meaningful feedback on your performance form colleagues?	0.64
	DP3: In this school year, have you had colleagues observe you classroom?	0.82
	DP4: In this school year, have you invited someone to help teaching your class(es)?	0.27

*Minimum CVR value is .59 when there are 11 teachers participating in the survey validation process (Lawshe, 1975)

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